

Thyroptera tricolor. By Don E. Wilson and James S. Findley

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Thyroptera Spix, 1823

Thyroptera Spix, 1823:61. Type species *Thyroptera tricolor* Spix.

Hyonycteris Lichtenstein and Peters, 1854:335. Type species *Hyonycteris discifera* Lichtenstein and Peters.

CONTEXT AND CONTENT. Order Chiroptera, Suborder Microchiroptera, Family Thyropteridae, Genus *Thyroptera*. The genus *Thyroptera* includes two living species, *Thyroptera discifera* and *T. tricolor*.

Thyroptera tricolor Spix, 1823

Spix's Disk-winged Bat

Thyroptera tricolor Spix, 1823:61. Type locality "ad littora fluminis Amazonum," Brazil; restricted to the lower Amazon River below Santo Antonio Dolca at the mouth of the Rio Ica, by Husson (1962:204).

Thyroptera bicolor Cantraine, 1845:489. Type locality "Surinam."

Hyonycteris albiventer Tomes, 1856:179. Type locality "River Napo, near Quito."

CONTEXT AND CONTENT. Context noted above under genus *Thyroptera*. Three subspecies of *Thyroptera tricolor* currently are recognized (Cabrera, 1958):

T. t. tricolor Spix, 1823:61, see above (includes *Thyroptera bicolor* Cantraine as synonym).

T. t. albiventer (Tomes, 1856:179), see above (includes *T. bicolor* Espada, 1870:21—not Cantraine, 1845, and *T. t. albigula* G. M. Allen, 1923:1 as synonyms).

T. t. juquiaensis Vieira, 1942:391. Type locality "Fazenda Poco Grande Rio Juquia, Municipio de Iguape, Estado de São Paulo," Brazil.

DIAGNOSIS. *Thyroptera tricolor* is likely to be confused only with *T. discifera*, from which it differs as follows: dorsal color reddish brown or blackish; venter white or pale yellowish; calcar with two cartilaginous projections extending into posterolateral border of uropatagium. *Thyroptera discifera* is more uniformly dark colored above and below, and the calcar has only one cartilaginous projection.

GENERAL CHARACTERS. For illustrations see the following: Spix (1823:61, pl. xxxvi, fig. 6—dorsal view); Wagner (1843); Cantraine (1845:492-495, color plate, fig. 1—ventral view of animal, fig. 2—right side view of head, figs. 3-4—disk of the thumb); Dobson (1878:345-346); Miller (1896:112); Miller (1907:190-193); G. M. Allen and Barbour (1923:272); Vieira (1942:387-390; fig. 33—ventral view of animal); Hershkovitz (1949:450-451); Hall and Kelson (1959:157, fig. 115—ventral, lateral, and dorsal views of skull); Goodwin and Greenhall (1961:274-276, fig. 88—under side of thumb and foot with disks, fig. 89—front view of head, pl. 30, figs. 4-6—skull); Husson (1962:203-208, fig. 32—head, thumb disk, foot disk, table xxii—Measurements); Walker (1964:332, ventral view of animal, ventral view of wing, thumb disk, hind foot); Villa-R. (1966:352-358; fig. 122—dorsal and ventral views of animal, fig. 125—lateral view of animal, thumb disk, head, foot disk, skull).

Forearm length is 33.5 to 37.5 mm; a circular, suctorial disk is at base of thumb, a smaller one at base of sole of hind foot; ears are separated and funnel-shaped; tragus curves inward with small lobule near base; thinly haired interfemoral membrane reaches to feet, with thin fringe of hair on free margin. Calcar is about 8 mm, extends half way between foot and tail, and has two conspicuous cartilaginous projections; hind foot is about 5 mm, the third and fourth toes are joined; tail extends slightly beyond edge of interfemoral membrane; fur is long and dense; dorsal surface is dark brown to reddish

brown, ventral surface white or pale yellowish; sides are brownish; ears are blackish; membranes are dark brown, occasionally with white mottling.

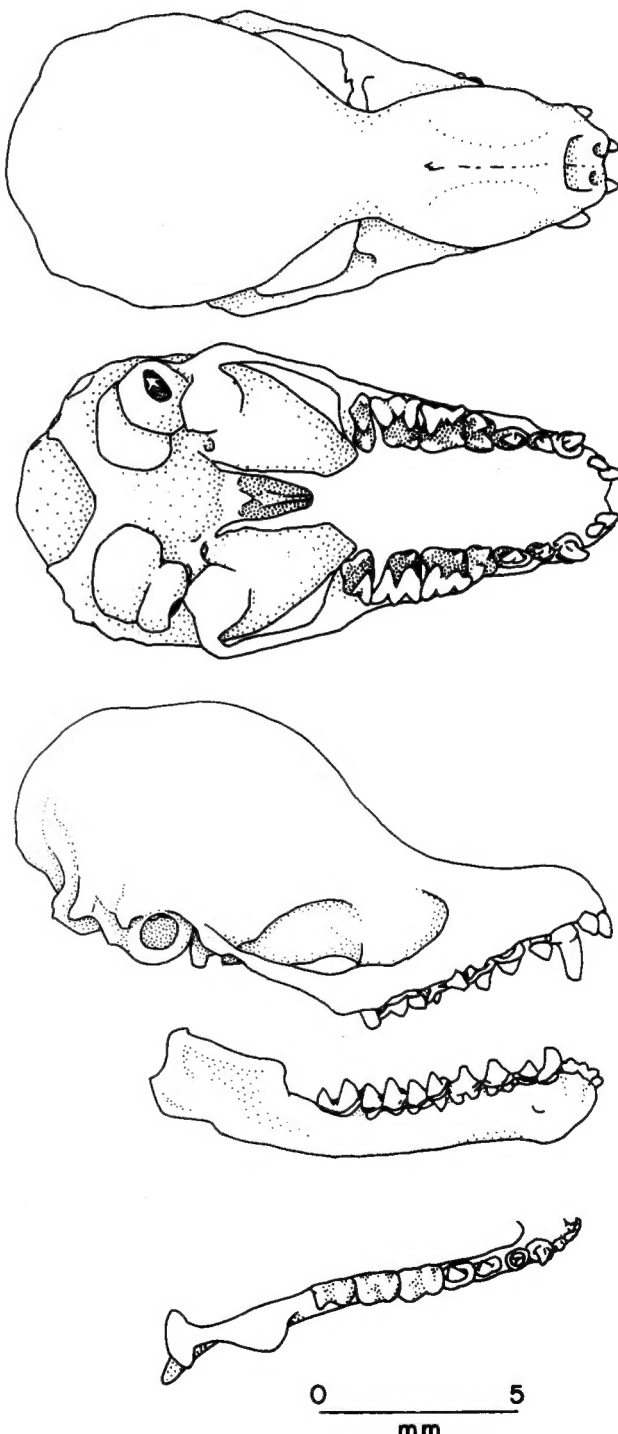


FIGURE 1. Views of skull and mandible of *Thyroptera tricolor* (USNM 281197). Illustration by Wilma Martin.

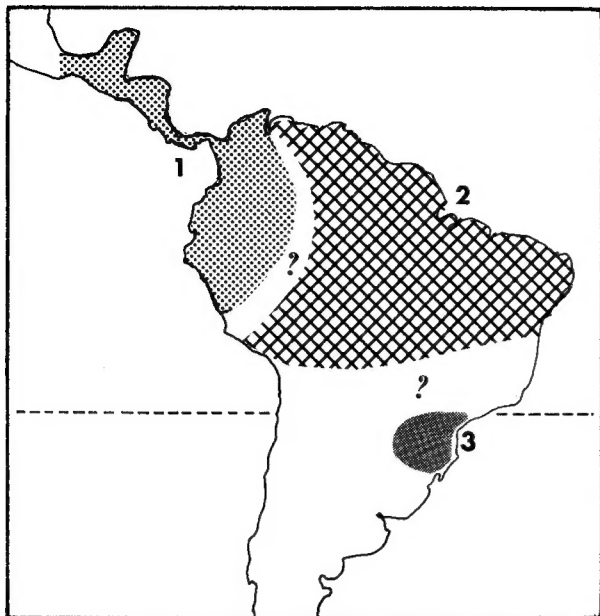


FIGURE 2. Map of Neotropical America showing known distribution of *Thyroptera tricolor*. Numbers indicate subspecies, as follows: 1, *T. t. albiventer*; 2, *T. t. tricolor*; 3, *T. t. juquiaensis*.

Dental formula is $i\ 2/3$, $c\ 1/1$, $p\ 3/3$, $m\ 3/3$, total 38; upper inner incisors are separated and have a postero-external cusp; upper outer incisors have a postero-external cusp or are unicuspidate, are slightly smaller than inner incisors, and are almost in contact with them; outer incisors are separated from canines by small space; the first upper premolar (P1) is the smallest, P2 is intermediate, and P3 is much larger; P1 touches the canine; premolars are in contact with each other; P3 touches M1; lower incisors are trilobed, outer largest, and form a continuous row between canines; lower canines are small, slender, and low; lower premolars are in contact with each other; p1 is slightly smaller than p2 and p3. Figure 1 shows general features of the skull, jaws, and dentition.

DISTRIBUTION. The species inhabits the Neotropical region (figure 2). The northernmost record is apparently near Sontecomapán, Veracruz, México (Villa-R., 1966). The southernmost record is the type locality of *T. t. juquiaensis* in southern Brazil. Exact limits of the three subspecies are difficult to determine owing to a paucity of specimens. *Thyroptera tricolor* is apparently a species of lowland forest areas.

FORM. The most striking anatomical adaptation of these bats is the presence of circular suctional disks on the thumb and hind foot (figure 3). The concave surface of the disk has a dermatoglyphic pattern and is maintained in a permanently moist condition. Carvalho (1939), Wimsatt and Villa-R. (1970), and Findley and Wilson (1974) all noted the tendency of these bats to groom the disks frequently by licking them. A biconcave cartilaginous framework supports the disk, the rim of which is made up of 60 to 80 chambers, each equipped with a sudoriferous gland that discharges onto the margin of the disk face. Glandular form and cytology were described in detail by Wimsatt and Villa-R. (1970) and by Schliemann (1970). In addition they described the epidermis, adipose tissue, muscle insertions, disk relation to digital joints, and sensory endings. The disks lack intrinsic musculature and are operated from without. Wimsatt and Villa-R. (1970) suggested that the adhesive force of the disks may be to some extent adjustable.

The skull is small and delicate, with a large, rounded braincase rising abruptly behind the rostrum (figure 1). The rostrum is low, weak, and narrow, and its upper surface is almost flat. Measurements in millimeters (from Hall and Kelson, 1959; Goodwin and Greenhall, 1961; Husson, 1962; Villa-R., 1966) are as follows: greatest length 13.5 to 15.1; condylobasal length 12.4 to 13.7; condylocanine length 12.3 to 13.0; basal length 11.5 to 12.3; palatal length 6.3 to 7.0; zygomatic breadth 6.8 to 7.8; breadth of braincase 6.5 to 7.6; height of braincase



FIGURE 3. *Thyroptera tricolor albiventer* from Costa Rica hanging by suction disks from glass cage.

6.1 to 6.3; interorbital constriction 2.3 to 2.9; width across molars 4.7 to 5.3; width across canines 2.7 to 2.9; maxillary tooththrow 5.5 to 5.8; mandibular tooththrow 5.8 to 6.1; length of mandible 10.2 to 10.6.

Post-cranial anatomy resembles that of the families Natalidae and Furipteridae (Miller, 1907), except that the trochiter is larger than the trochin, the second digit is reduced to a rudimentary metacarpal, and the third digit has three bony phalanges. The pectoral girdle has a small presternum with a narrow keel slanting forward; a broad, flat, unkeeled mesosternum; and a long, slender, ridged xiphisternum. The first and second thoracic vertebrae are fused, and the last caudal vertebra is rudimentary (Walton and Walton, 1970). The toes have only two phalanges each, and the third and fourth digits are syndactylous. The fibula is threadlike and extends only about half the length of the tibia. The pelvis has a small pubic spine and the obturator foramen is much reduced. The ischia are wide apart posteriorly, and males have a symphysis pubis. The two posterior sacral vertebrae are distinct, but the remainder are fused.

FUNCTION. Wimsatt and Villa-R. (1970) presented a detailed account of the functioning of the adhesive disks, which function by suctional adhesion; the bats are capable of moving on smooth as well as irregular surfaces. Findley and Wilson (1974) observed the locomotion of *T. tricolor* in a glass-fronted cage. Neither the pollex nor any of the toes touch the surface when the bat walks, leaving the only functional contact to the disks. These bats would not crawl on the floor of the cage, and had difficulty with the wooden sides and wire top, but readily moved about on the glass front.

ONTOGENY AND REPRODUCTION. Findley and Wilson (1974) found pregnant females in August in Costa Rica. At the same time, there were full-grown, but obviously young animals in the population.

ECOLOGY. Findley and Wilson (1974) studied the ecology of *Thyroptera tricolor* in Costa Rica. They found individuals regularly in rolled leaves of *Heliconia* (Musaceae) and occasionally in *Calathea* (Marantaceae) growing in the forest, in

clearings, and along the edges of roads and trails. In their study area, a shaded section of forest where the plants were sparsely distributed, they found these bats in approximately every fourth suitably rolled leaf examined. Villa-R. (1966) also found *T. tricolor* in shady forest. The bats inhabit leaves with the diameter of the opening between 50 and 100 mm. A given leaf remains in the favorable size range for only 24 hours.

Several kinds of beetles and flies, and various larval insects were found in the leaves with the bats. Large orthopterans, which also used the rolled leaves, never shared them with the bats.

The bats occurred in colonies of from one to nine individuals with a mean of six. The colonies showed a definite social cohesion and individual members of a colony tended to remain together every day. Within the colonies, there was no predictable age or sex structure, but a sex ratio of 1:1 obtained for the population as a whole. Thirty-three per cent of 58 animals aged were young, as judged by their dark brown immature pelage.

Distances between recaptures of individual bats ranged from 5 to 91 meters, with a mean of 42.5 meters. Findley and Wilson (1974) estimated the roosting area of a single colony to be approximately 3000 square meters, and from this calculated a probable density of 3.3 colonies and 19.8 bats per hectare. They actually counted 3.7 colonies and 21.9 bats per hectare in their study area.

From 21 leaves, Findley and Wilson (1974) collected fecal samples, which ranged from 0.10 to 0.54 g, with a mean of 0.21 g. From this they estimated that *Thyroptera tricolor* may consume up to 0.8 g of insects per night per individual.

Abundance of the species seems to be limited by roost availability. Morphological specializations of the bats probably limit them to rolled leaves as roosting sites. Their tendency to roost head up is well adapted to rolled leaves, but not to the more normal bat roosting sites such as caves or hollow trees.

BEHAVIOR. Findley and Wilson (1974) described some aspects of group behavior in this species. A bat released after examination flew in small circles around the bag containing his roost-mates and alighted on the bag several times. It eventually flew to a nearby rolled leaf, and after circling several times, landed and disappeared. The next three bats released went directly to the leaf and after circling it, entered also. The next bat entered a second rolled leaf, and three subsequent bats also went immediately to the second roost. The last bat went to the first leaf and joined its companions, although there was barely room in the overcrowded leaf. Findley and Wilson (1974) felt the animals were definitely communicating with each other.

GENETICS. Baker (1970) presented the karyotype of *Thyroptera tricolor*. The diploid number is 40 and the fundamental number is 38. Both X- and Y-chromosomes are acrocentric.

REMARKS. The synonymies used here are adapted from Cabrera (1958). The infra-specific classification is somewhat confused owing to some doubt about the validity of *T. t. juquiaensis*. Subspecific boundaries are not well established for the other two subspecies. *Thyroptera* is Greek for "disk-winged," *tricolor* refers to the pelage color, *albiventer* refers to the white venter of that subspecies, and *juquiaensis* is named for the Rio Juquia in Brazil.

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